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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/647,586	08/25/2003	Michael Seltzer	M61.12-0550	2416

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EXAMINER	
SHAH, PARAS D	
ART UNIT	**PAPER NUMBER**
2609	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	02/06/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No.	Applicant(s)	
	10/647,586	SELTZER ET AL.	
	Examiner	Art Unit	
	Paras Shah	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) \ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *25 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/31/05,03/21/05, 02/27/06*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The Office Action is in response to the Application filed on 08/25/2003.

Claim Objections

2. Claim 1 is objected to because of the following informalities: "noise-reduced speech signal" in line 3 is unclear as to the "noise reduced value", should be "noisy speech signal". Appropriate correction is required.

3. Claims 2, 3, and 6 are objected to because of the following informalities: "a noisy speech signal" in line 2. Appropriate correction is required.

4. Claim 3 is objected to because of the following informalities: "a noisy speech signal" in line 2. Appropriate correction is required.

5. Claim 8 is objected to because of the following informalities: " the scaling factor" in line 4. Appropriate correction is required.

6. Claims 14-17 are objected to because of the following informalities: "a harmonic component" in line 2. Appropriate correction is required.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 4-5 and 20-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. Claim 4 recites the limitation "the energy " in line 3. There is insufficient antecedent basis for this limitation in the claim.

10. Claim 20 recites the limitation "the energy " in line 4. There is insufficient antecedent basis for this limitation in the claim.

11. Claims 5 and 21-23 are also indefinite since they depend upon indefinite claims 4 and 20.

Claim Rejections - 35 USC § 102

12. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1-3, 6, 11-16, 18-19, and 24 are rejected under 35 U.S.C. 102(b) as being anticipated by Laroche *et al.* ("HNM: A Simple Efficient Harmonic and Noise Model for Speech" 1993)

As to claims 1, 13, and 19 Laroche *et al.* discloses a method of identifying an estimate for a noise reduced value representing a noise-reduced speech signal, the method comprising: decomposing a portion of a noisy speech signal (see page 1, left column, sect. 1, line 2-3) into a harmonic component (see page 1, left column, sect. 1, line 2) and a random component (see page 1, left column, sect. 1, line 2-3) (e.g. It should be noted that noise contained in speech is non-periodic and is random); determining a scaling parameter (see page 2, left column, sect. 3, 1st paragraph, line1)

for at least the harmonic component (see page 2, right column, sect. 3, line1); multiplying the harmonic component by the scaling parameter for the harmonic component to form a scaled harmonic component (see equation 1) (e.g. It is inherent that once the amplitude, fundamental frequency, and pitch harmonic parameters are obtained the result will yield a scaled result as seen by the term A_k in equation 2, which is used to complete equation 1); multiplying the random component by a scaling parameter for the random component to form a scaled random component (see equation 2) (e.g. It is evident from the stated equation that there is two scaling components, one is a windowing function and the other is a normalized all pole filter. The equation represents the stochastic component, which is a random component); and summing the scaled harmonic component and the scaled random component to form the noise-reduced value (see page 3, right column, sect. 4, lines 6-8) (e.g. It is inherent that the synthetic signal is formed by the harmonic component and the random component from equation 1 and 2).

As to claims 2,14, and 18 Laroche *et al.* discloses wherein decomposing a portion of a noisy speech signal comprises modeling the harmonic component as a sum of harmonic sinusoids (see page 1, right column, sect. 1, lines 1-3 and equation 1) (e.g. It is apparent that equation 1 can be put in terms of cosine and sine using Euler's Relation).

As to claims 3 and 15, Laroche *et al.* discloses wherein decomposing a portion of a noisy speech signal further comprises determining a least-squares solution to identify the harmonic component (see page 2, left column, sect. 3, 2nd paragraph, lines 1-5)

(e.g. It should be noted that a least squares method is used to estimate the parameters to obtain the harmonic component. The voiced segment is the harmonic component).

As to claims 6 and 16, Laroche *et al.* discloses wherein decomposing a portion of a noisy speech signal comprises decomposing a vector of time samples from a frame (see page 1, right column, sect. 2, line 5-8) of the noisy speech signal into a harmonic component vector of time samples and a random component vector of time samples (e.g. It is inherent that the use of time samples is used as seen by the summation bounds for equation 1. Further, the random signal is obtained from the subtraction of the original speech signal by the harmonic part, which is also a specific time sample size).

As to claims 11 and 24, Laroche *et al.* discloses where the noise-reduced value (e.g. also known as the synthesized signal described above) is used to perform speech recognition (see page 3, right column, sect. 6, line, 1st paragraph, line 2) (e.g. It is apparent that the use of speech enhancement directly relates to speech recognition). The feature vector referred to is described as being the signal representing the noise reduced signal, which is obtained from the steps stated in claim 1.

As to claim 12, Laroche *et al.* discloses where the noise-reduced value (e.g. also known as the synthesized signal described above) in speech coding (see page 3, right column, sect. 6, line, 1st paragraph, line 2) (e.g. It is apparent that the use of the HNM model for speech enhancement and timbre modification directly relates to speech coding since the intelligibility of the signal is of importance, which relates to the noise component).

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. Claims 4-5 and 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laroche *et al.* as applied to claims 1 and 19 above, and further in view of Yumoto *et al.* ("Harmonics-to-noise ratio as an index of the degree of hoarseness" 1982).

As to claims 4-5 and 20, Laroche *et al.* does not specifically disclose the determining of the scaling parameter from the ratio of the energy of the harmonic component to the noisy speech signal. Yumoto *et al.* discloses a method for calculating a H/N ratio where the energy of the harmonic component is divided by the noise component (see page 1545, left column equation 4) (e.g. The f_A is the speech signal and the f_i is the noise component. Both components are summed and then divided). Although Yumoto *et al.* does not specifically disclose the noise component being the noisy speech signal, it would have been obvious to one of ordinary skilled in the art to

have divided the ratio of the energies of the harmonics to the noisy speech signal. The motivation to modify the equation is consistent with the definition of signal to noise ratio, where the relative strength of the harmonics can be found by dividing it by the entire signal including noise. This would allow a percentage or value to be identified for that specific time frame of harmonic strength in comparison to the noisy speech signal.

As to claim 21, Yumoto *et al.* discloses the scaling value for the harmonic component is separately determined for each time in segment of the noisy speech signal (see page 1545, left column equation 4) (e.g. The bounds of the integral is sufficient for each frame segment desired.)

As to claim 22 and 23, Laroche *et al.* discloses multiplying the random component by a scaling value for the random component to form a scaled random component (see equation 2 and equation 9) (e.g. It is evident from the stated equation that there is two scaling components, one is a windowing function and the other is a normalized all pole filter) (From equation 9, it is evident that the equation can be modified to account for specific time intervals as denoted by t_i).

15. Claims 7-10, 17, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Laroche *et al.* as applied to claims 6, 16, and 24 above, and further in view of Seltzer (CMU Speech Group 1999).

As to claims 7 and 17, Laroche *et al.* does not specifically disclose the determining of the Mel spectrum for the harmonic component from the harmonic component vector of samples. Seltzer does disclose the determination of the Mel

spectrum from a speech signal (see page 1,sect. 2, Block Diagram). It would have been obvious to one of ordinary skilled in the art to have modified the harmonic plus noise model presented by Laroche *et al.* by that of Seltzer to find the Mel Spectrum. The motivation to combine the two involves the extraction of features from the speech signal. The Mel spectrum also enables the detection of voiced segments allows the frequency amplitudes to be seen. The speech signal in this case is the synthesized harmonic component. This method is commonly used in speech recognition systems.

As to claim 8, Laroche *et al.* does not specifically disclose the multiplication of the Mel Spectrum for the harmonic component with the scaling factor. Seltzer does disclose the calculation of the Mel Spectrum (see Page 2, sect. 4d., see equation) by the harmonic component with the scaling factor pre-multiplied from an input speech signal. The speech signal in this case is the harmonic component that was modeled. The multiplication of the scaling factor could have been pre-multiplied as the frequency content of the signal will not change, but rather the amplitude. However, since the scaling factor applies to all frequency components, the scaling factor can be also multiplied after the Mel Spectrum is obtained, which will allow the same result to be obtained.

As to claims 9,10 and 25, Laroche *et al.* does not specifically disclose the forming of the Mel Frequency Cepstral Coefficients. Seltzer discloses the forming of Mel Frequency Cepstral Coefficients feature vector (see Page 3, sect. 4e, equation) from a speech signal for speech recognition (page 1, sect. 1, line 1). This is found from the Mel Spectrum.

Conclusion

16. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The US PG Pub 2001/0018655 is cited to teach a method for determining voicing probability for speech signals.

The NPL documents by Virtanen *et al.* (IEEE International Conference 2002) and Stylianou (IEEE Transactions 2001) are cited to teach a method separation of harmonic sounds.

The NPL documents by Seltzer (Carnegie Mellon University 2000), Chazan *et al.* (IEEE Conference 2000) and Eronen (Tampere University of Technology 2001) are cited to teach method and application to calculate Mel Frequency Cepstral Coefficients.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Paras Shah whose telephone number is (571)270-1650. The examiner can normally be reached on MON.-FRI. 7:30a.m.-5:00p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Xiao Wu can be reached on (571)272-7761. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

P.S.

1/3/2007

XIAO WU
SUPERVISORY PATENT EXAMINER